

SPACE CENTER

# Roundup

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## NASA rovers make tracks to Mars

In this artist's rendering, a NASA Mars Exploration Rover (MER) inspects geological features on the surface of Mars. Johnson Space Center scientists will help to control the MERs from Earth.

*To read more about Mars exploration, see pages 4 and 5.*

## Director's Message



### Back in the saddle

As a young boy growing up in Victoria, Texas, during the late 1940s, cowboy action was the most popular fare at the local movie theaters. Roy Rogers, John Wayne and a host of other screen stars rode across the plains wearing white hats

and fighting bad guys. I have a vivid memory of Gene Autry starring in his first movie after returning from serving in World War II. I can still see him riding down the trail on his faithful horse, Champion, singing "I'm Back in the Saddle Again." That was a great moment for all of us who thought he was the best of them all.

That same theme, "Back in the Saddle," was picked up by Naval Aviation organizations as a program to emphasize safety awareness following the annual holiday season. Analysis had proven that there was a traditional spike in both aircraft and ground accidents in the January/February time frame. The Back in the Saddle Program is usually a one- to two-day safety stand-down in which cockpit and maintenance procedures are reviewed and personnel tested. It has proven to be an effective way for Navy and Marine squadrons to get rid of the mental cobwebs and distractions that come with holiday festivities.

We need to get back in the saddle, too! Return to Flight activities, support of the International Space Station, spacewalk training, payloads planning, mission training, etc., are going to require all of us to be on the ball every hour of every working day if we are going to be safe and successful. There is too much at stake for the future of human space exploration for us to drop the ball.

The holidays are over. We must be top professionals and focus on the job at hand. I expect all hands to ensure that they and their teammates are on top of their game. Let's get back in the saddle and succeed!

Beak sends...



APPEARING THIS MONTH IN OUR

## Guest Space

### Dr. Steven A. Hawley

Associate Director, Office of Astromaterials Research and Exploration Science



We are entering a new and exciting time for planetary science here at the Johnson Space Center, specifically in the Astromaterials Research and Exploration Science (ARES) Office in the Space and Life Sciences Directorate, where scientists are working on projects ranging from Mars exploration to solar wind collection.

Beginning with Beagle 2 last month and two Mars Exploration Rover missions this month, three Martian landings will be attempted over a one-month period. Each one has significant participation by JSC scientists.

As part of the European Space Agency's Mars Express mission, Beagle 2 will search for signs of past and present life on Mars, marking the first time since Viking that a spacecraft sent there will probe for both. To search for signs of past life, soil and rock samples will be gathered from the Martian surface, subsurface and inside rocks and analyzed using the Beagle's unique laboratory. To look for current life on Mars, instruments will search for signs of methane in the atmosphere. ARES scientist Everett Gibson, NASA Planetary Geochemist, is the only American interdisciplinary scientist on the Beagle 2 international science team.

Due to land on Mars this month are two Mars Exploration Rovers, Spirit and Opportunity. During the course of their three-month missions, the vehicles will explore two regions of Mars. Two types of cameras, a color stereo panoramic camera and an infrared camera, will provide pictures of the landscape. The pictures are used for driving the rovers, for "remote-sensing" mineral analysis, and for selecting rocks and soils for detailed analysis by the instruments on each rover's robotic arm. The robotic-arm instruments perform chemical and mineralogical analyses of rocks and soil. The arm also has a tool to grind off rock surfaces and a microscope to look for small features, including fossil evidence for of life.

The golf-cart-sized rovers will seek evidence about whether the environment in the two regions might once have been capable of supporting life. Spirit will explore the Gusev Crater, which may have once held a lake. Opportunity will examine Meridiani Planum, which contains exposed deposits of a mineral that usually forms under watery conditions. ARES scientists helped select the two landing sites.

Two ARES scientists – Doug Ming, NASA Soil Mineralogist, and Dick Morris, NASA Physical Chemist – will help operate the two rovers. Each Mars day, they and other members of the science team determine the scientific observations and measurements that will be made and what driving will be done. Morris and Ming have specific responsibilities for developing the commands that will be uplinked to the rovers and for calibrating and doing preliminary analysis on downlinked data.

Morris and Ming are also involved in future missions to Mars. Morris is a co-investigator on the Compact Reconnaissance Imaging Spectrometer for Mars instrument, a component of the Mars Reconnaissance Orbiter mission slated for 2005. Both scientists are co-investigators on the 2007 Phoenix Scout Mission, which will search for ice that has been discovered by the Mars Odyssey science team. Ming is heavily involved in defining the science priorities and objectives and the science instrument suite for the Mars Science Laboratory mission set for 2009.

From the first Moon rocks of the late 1960s to today's Martian meteorites, JSC scientists have led the way in the study of fascinating rocks to better understand how our solar system, and perhaps life itself, came into being. The ARES Office, originally known as the Lunar Samples Office, was formed to investigate and curate Apollo lunar samples. New samples have been added over the years including meteorites – some from the Moon, some from Mars (as ARES scientist Don Bogard has demonstrated conclusively) – and cosmic dust from aircraft.

Soon solar wind and comet samples will be added to this collection. Benchmark facilities for payload cleaning and curation already await the return of these samples. The Genesis spacecraft will return samples of the solar wind to Earth in September, marking NASA's first return of extraterrestrial samples since Apollo 17 in 1972. The samples will be brought to JSC and stored in the Genesis Lab, where ARES scientists will first assess the condition of the sample collector and then remove the samples for further study. Research conducted on the samples may help scientists better understand how the solar system developed. In addition, this month the Stardust spacecraft will encounter Comet Wild 2. Once the Sample Return Capsule is recovered at the Utah Test and Training Range in January 2006, its contents will be transported to the Curation Laboratory at JSC.

From Mars exploration to sample return curation and study, ARES scientists will be busy conducting missions and analyzing data this year and in the years ahead, searching for clues as to how our solar system, and life itself, originated.



# Return to Flight: STS-114 continues the dream

By Joanne Hale

**T**HE STS-114 CREW is in place for the Space Shuttle's Return to Flight mission.

Three Mission Specialists have been added to the four astronauts already in training for the STS-114 mission planned for launch no earlier than September 2004. The new crewmembers are Andrew Thomas (Ph.D.), Wendy Lawrence (Capt., USN) and Charles Camarda (Ph.D.). They will join mission Commander Eileen Collins (Col., USAF), Pilot James Kelly (Lt. Col., USAF) and Mission Specialists Stephen Robinson (Ph.D) and Soichi Noguchi, of the Japan Aerospace Exploration Agency, who were named to this flight in 2001.

"STS-114 is going to be a complex developmental test flight, and this crew has the right set of skills and experience to help get the Space Shuttles safely flying again," said NASA's Associate Administrator for Space Flight, William Readdy. "STS-114 was always slated to have a crew of seven. But now, instead of three crew rotating on-and-off the International Space Station, all crewmembers will be dedicated to the STS-114 mission objectives."

The major mission objectives of the STS-114 flight have shifted from Space Station logistics and crew rotation to testing and evaluating new procedures for flight safety. This includes Shuttle inspection and repair techniques. It also includes a smaller set of Space Station tasks from what was scheduled before the Shuttle *Columbia* accident in February.

"This is a demanding mission; and the addition of Andy, Wendy and Charlie to this already well-qualified crew ensures they have all the skills necessary to meet the challenge of Return to Flight and the resumption of Space Shuttle support of the International Space Station," said Bob Cabana, Director of Flight Crew Operations at NASA's Johnson Space Center.

At right, the STS-114 crew shares their feelings about being selected to be the first crew to return to flight following the *Columbia* tragedy.



**Eileen Collins**

*I believe NASA's mission goes past STS-114 to the future of the Space Station and planetary exploration. The return to flight is more of a beginning versus an end. The 114 flight will be a milestone. It will be a beginning to our future.*



**Jim Kelly**

*I take pride in the fact that there are so many people on the ground that are dedicated to the job and are able to get us up into space. My pride centers far more around the team than it does around me individually, with the team being my crewmates, my office staff, flight crew operations and the whole NASA family.*



**Wendy Lawrence**

*I feel very honored to be added to the crew. Whoever is flying on the next flight knows it is to honor the Columbia crew because their desire was to continue what they believed in. I am honored to be in a position to do that.*



**Steve Robinson**

*I have got 27 years on the books at NASA, and every single one of those I have felt that this was a truly great organization to work for because of its people. It is those very same people that give me great pride to be part of the team that brings the Shuttle back into space.*



**Charlie Camarda**

*It is a sobering thought to be following in their footsteps. Three crewmembers were my classmates and all were my friends. Accidents can happen – spaceflight is risky. We need to do whatever we can to minimize the risk. Hopefully, we learned a lot from this tragedy, and we can improve NASA and how we do business. I see this as an opportunity to affect a change at NASA – a return back to focus on research and engineering.*



**Andy Thomas**

*I think it is very important to demonstrate a success. The Agency is still able to support the national goals of human spaceflight and continues to be the Agency that keeps the presence of the U.S. in space.*



**Soichi Noguchi**

*Of course in Columbia I had three crewmembers from my training class – the class of 1996. We will try to bring the Shuttle back in good condition and continue their dream of flying in space. Once I get back after the mission, I am sure I will feel that we brought back the seven souls with us on Atlantis.*

**For more information about the STS-114 mission and crew, please visit**

<http://spaceflight.nasa.gov/shuttle/archives/sts-114/index.html>

# Fourth rock from the Sun takes center

By Bill Jeffs

## British-developed Beagle 2 designed to sniff out life on Mars

*Editor's note: As of press time, the Beagle 2 lander and Mars Exploration Rovers were all on their way to the Red Planet.*

**H**itchhiking on the Mars Express spacecraft developed by the European Space Agency (ESA), the British-developed Beagle 2 was launched June 2 on a Soyuz-Fregat rocket from the Baikonur Cosmodrome in Kazakhstan to begin its 250-million-mile, six-month journey to Mars.

"Beagle 2 is the first-of-a-kind spacecraft uniquely equipped to search for signs of past and present life on Mars," said Everett Gibson, NASA Planetary Geochemist at Johnson Space Center. Gibson is the only American interdisciplinary scientist chosen by ESA to be a member of the Beagle 2 international science team.

"The goal of Beagle 2 is to enable us to establish evidence of whether life existed in the past on Mars," Gibson said, "or at least enable us to establish if the conditions there were ever suitable for the formation of life, and, significantly, to search for present signs of life."

Beagle 2 was scheduled to separate from the Mars Express spacecraft on Dec. 19 to begin its descent at a rate of 14,000 mph.

The spacecraft's planned landing site was Isidis Planitia, the third-largest basin on Mars. Possibly filled with sediments deposited at the bottom of long-vanished lakes or seas, the site offers an ideal environment for preserving traces of life. The site was chosen for this reason, and to enable Beagle 2 to communicate with orbiting spacecraft – Mars Express and NASA's Odyssey and Global Surveyor, already in orbit about Mars. These spacecraft are to relay information back to control centers in Darmstadt, Germany, and Leicester, England.

With a mass of only 73 pounds, ESA's Beagle 2 lander represents the most ambitious science payload-to-systems mass ratio ever attempted. About one-third of the payload was designed to carry out various types of scientific analysis or be used to manipulate and collect samples for study on the surface of Mars.

"In 1976, the two Mars Viking landers searched for signatures of life, but the analytical results were either negative or indeterminate," Gibson said. "Our abilities to detect the presence of trace levels of the biogenic elements...are better now. Beagle 2 is carrying a much more powerful suite of instruments to detect the signatures of past or present life."

Beagle 2 has been in development for more than six years. In 1997, when ESA announced the Mars Express mission, the possibility of a lander dedicated to looking for life and conducting geochemical and atmospheric analyses was put forward by Colin Pillinger, a professor at The Open University in England and a member of the ESA Exobiology Study Group. The lander was soon named Beagle 2 to celebrate Charles Darwin's 1831 voyage on *HMS Beagle*, when he sailed as the ship's naturalist and which led to the writing of "On the Origin of Species."

Design of the spacecraft – led by a British consortium of universities, research support teams and industry – progressed quickly. Testing on the spacecraft's airbag landing system was conducted in the vacuum chamber at JSC in late 2002 and early 2003 (see sidebar).

The spacecraft is one of a number of ongoing robotic missions to Mars, including NASA's Mars Exploration Rovers (see sidebar).

"This is an exciting time for space science and robotic missions," Gibson said.



This illustration shows the Beagle 2 lander exploring Mars for signs of life.  
All Rights Reserved Beagle 2

### Beagle 2 landing test: Let me down easy

Beagle 2 was designed to land somewhat softly, surrounded by a system of airbags that are planned to inflate between 1,200 and 1,500 feet above the surface of Mars. To test this system, ESA needed to drop and accelerate the assembly from a high distance and to do so in a vacuum environment.

JSC's unique vacuum chamber, Chamber A in Building 32, fit the bill. Arrangements were made to test the assembly there in 2002. In the course of the testing, adjustments were made to the assembly's inflation pressure and jettison pyrotechnics until everything functioned as designed.

Final testing was done in early 2003, and Beagle 2 was successfully launched on June 2.

The enormous Chamber A in JSC's Building 32 provided the perfect location for the Beagle 2's landing tests.

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Photo by Robert Markowitz

